# Unit 13 - Week 10 :



## Assignment 10

**The due date for submitting this assignment has passed.** Due on 2019-10-09, 23:59 IST.
**As per our records you have not submitted this assignment.**

1) **Common Data for Questions 1 and 2:** 1 point

A heat engine receives 1 kW of heat transfer at 1200 K and gives out 600 W as work, with the rest as heat transfer to the ambient at 300 K. The first-law efficiency of the heat engine is

(a) 60 %
(b) 75 %
(c) 80 %
(d) 85.7 %

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
a

2) The second-law efficiency of the heat engine is 1 point

(a) 60 %
(b) 75 %
(c) 80 %
(d) 85.7 %

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
c

3) **Common Data for Questions 3 and 4:** 1 point

A heat exchanger with no external heat transfer increases the availability of 3 kg/s of water by 1500 kJ/kg using 10 kg/s air coming in at 1400 K and leaving with 600 kJ/kg less availability. What is the irreversibility?

(a) 1050 kW
(b) 1500 kW
(c) 1500 kW
(d) 6000 kW

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b

4) What is the second-law efficiency of the heat exchanger? 1 point

(a) 25 %
(b) 33.33 %
(c) 75 %
(d) 82.5 %

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
c

5) An air compressor takes air in at the state of the surroundings, 100 kPa and 300 K, at the rate of 2 kg/s. The air exits the compressor at 400 kPa, 600 K. The changes in kinetic and potential energies are negligible, and no heat transfer occurs during this process. Assume air to be an ideal gas with constant specific heats. The gas constant of air is $R$=0.287 kJ/kg.K and the ratio of specific heats, $\gamma = \frac{c_p}{c_v}$ =1.4. The reversible work input between the inlet and the exit states is 1 point

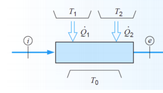
(a) 106 kW
(b) 212 kW
(c) 293 kW
(d) 424 kW
(e) 603 kW

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
d

6) **Common Data for Questions 6 and 7:** 1 point

A feedwater heater has 1 kg/s of water at 5 MPa and 40°C flowing through it, being heated from two sources, as shown in the figure below. One source adds 180 kW from a 100°C reservoir, and the other source transfers heat from a 200°C reservoir such that the water exit condition is 5 MPa, 180°C. The ambient temperature is 25°C.




Find the reversible work during this process.

(a) 36 kW
(b) 62 kW
(c) 127 kW
(d) 189 kW

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b

7) Find the irreversibility in this process. 1 point

(a) 62 kW
(b) 189 kW
(c) 127 kW
(d) 36 kW

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
a

8) Which among the following relations is/are TRUE? 1 point

(a) $\left(\frac{\partial T}{\partial v}\right)_s = \left(\frac{\partial p}{\partial s}\right)_v$
(b) $\left(\frac{\partial T}{\partial p}\right)_s = \left(\frac{\partial v}{\partial s}\right)_p$
(c) $\left(\frac{\partial v}{\partial T}\right)_p = \left(\frac{\partial s}{\partial p}\right)_T$
(d) $\left(\frac{\partial p}{\partial T}\right)_v = \left(\frac{\partial s}{\partial v}\right)_T$

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b
d

9) Which among the following relations is/are correct? 1 point

(a) $du = c_v dT + \left[p - T\left(\frac{\partial p}{\partial T}\right)_v\right] dv$
(b) $dh = c_p dT + \left[v - T\left(\frac{\partial v}{\partial T}\right)_p\right] dp$
(c) $ds = c_v \frac{dT}{T} + \left(\frac{\partial p}{\partial T}\right)_v dv$
(d) $ds = c_p \frac{dT}{T} + \left(\frac{\partial v}{\partial T}\right)_p dp$

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b
c

10) $\left(\frac{\partial u}{\partial T}\right)_v \left(\frac{\partial T}{\partial u}\right)_p =$ 1 point

(a) 1
(b) $\frac{c_p}{c_v}$
(c) $\frac{c_v}{c_p}$
(d) $\frac{c_p - c_v}{c_v}$
(e) $\frac{c_p}{c_p - c_v}$

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
c

11) **Assertion (A):** On the $p - v$ diagram of an ideal gas (with $v$ on the horizontal axis and $p$ on the vertical axis), curves of constant temperature through any given state point have greater negative slopes than those of constant specific entropy. 1 point

**Reason (R):** $\frac{\left(\frac{\partial p}{\partial v}\right)_T}{\left(\frac{\partial p}{\partial v}\right)_s} = \frac{c_p}{c_v} > 1$

Choose the correct statement:

(a) Both A and R are true and R is the proper explanation of A.
(b) Both A and R are true, but R is not the proper explanation of A.
(c) A is true, but R is false
(d) A is false, but R is true

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
d

12) A closed system contains 0.5 kg ammonia at 10°C and 25% quality. Heat addition required to convert the entire liquid into saturated vapour at a constant pressure is 459 kJ. If the specific entropy of the saturated liquid ammonia at 10°C is 0.878 kJ/kg.K, the specific entropy of saturated vapour ammonia at 10°C (in kJ/kg.K) is 1 point

(a) 5.200
(b) 3.039
(c) 7.362
(d) 13.846

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
a